REMARKS

The specification is amended herein to remove reference to embedded hyperlinks and/or other forms of browser-executable code.

Claims 14-20 and 31-48 were pending in the application. Claim 40 was withdrawn from prosecution in the Office Action mailed June 17, 2003. Claims 19, 20 and 41 are canceled herein without prejudice or disclaimer. Claims 14-18, 20, 31-39 and 42-48 are presently pending.

Rejection of Claims Under 35 U.S.C. §112, First Paragraph

Claims 14-20, 33-36, 39 and 41-48 stand rejected under 35 U.S.C. §112, first paragraph as "containing subject matter which was not described in the specification...." The Action asserts that, "The specification disclosure does not sufficiently teach the method of identifying probes or analytes with carbon nanotube wherein the ligand is other than the elected species of nucleic acid." Applicant respectfully traverses the assertion. However, in the interest of advancing the prosecution of the pending claims, Applicant has amended independent claim 14 to recite a method for identifying one or more nucleic acids. Applicant reserves the right to prosecute subject matter concerning non-nucleic acid ligands in a continuation application.

The Action recognizes that the specification does sufficiently teach the method of identifying probes or analytes with carbon nanotubes wherein the ligand is the elected species of nucleic acid. Applicant respectfully asserts that the amended claims satisfy the requirements of 35 U.S.C. §112, first paragraph and requests withdrawal of the rejection.

Rejection of Claims Under 35 U.S.C. §112, First Paragraph

Claims 14-20, 31-39 and 41-48 stand rejected under 35 U.S.C. §112, second paragraph as being incomplete. The Action asserts that binding a probe to a ligand is essential to the claimed method. Applicant respectfully traverses. In some embodiments, a nanotube-labeled molecule might be identified without binding to another molecule. However, in the interest of advancing prosecution, Applicant has amended independent claim 14 to recite, "c) hybridizing the [nanotube-labeled] probes to the nucleic acids." Applicant reserves the right to prosecute subject matter concerning identification of target molecules without binding of a probe to a ligand in a continuation application.

The Action rejected claims 19-20 and 41-48 as indefinite, stating that, "It is unclear if the nucleic acid of the elected species of 'ligand' (Claim 20) is the same as the hybridization nucleic acid (Claim 41)." As claim 20 and 41 stand canceled, the rejection is moot. Applicant respectfully asserts that the pending claims are clear as to the nature of the nucleic acid.

Rejection of Claims Under 35 U.S.C. §102

Claims 14-15, 19-20, 33, 41-42 and 45-48 stand rejected under 35 U.S.C. §102(b) as anticipated by Massey et al. (U.S. 5,866,434). Applicant respectfully traverses the rejection. Rejection of claims under 35 U.S.C. §102 is improper unless each and every element of the claimed subject matter is found, either expressly or inherently described, in a single prior art reference. [*Verdegaal Bros. V. Union Oil Co. of California*, 814 F.2d 628,631 (Fed. Cir. 1987); MPEP §2131.] Claim 14, the only independent claim presently pending, recites the element of, "detecting the emission spectra of the excited nanotubes." Applicant submits that this element is nowhere disclosed in the reference of Massey et al.

The recited element of claim 14 specifically refers to detecting the emission spectra of the excited nanotube. Massey et al. provides no teaching whatsoever related to detecting an emission spectrum of a nanotube. Rather, in Massey et al. the nanotubes are merely used as structural supports. Any emission spectrum to be detected came from a ruthenium ECL label, not from the nanotube. The use of nanotubes as structural supports, rather than as signal emitting compounds, is emphasized by numerous statements in Massey et al. For example, the Abstract states that, "Graphitic nanotubes...are used as solid supports in electrogenerated chemiluminescent assays." "Association of electrochemiluminescent ruthenium complexes with the functional group biomolecule-modified nanotubes permits detection of molecules including nucleic acids...." (emphasis added) Massey et al. at col. 6, lines 29-31 states that graphitic nanotubes "can be labeled with compounds capable of being induced to luminesce." Clearly, Massey et al. contemplated that the luminescent signal would not be derived from the nanotubes, but rather from luminescent compounds that could be attached to the nanotubes. This is reiterated at col. 7, lines 44-46 which states that, "the invention is in a nanotube to which is attached a component linked to a label compound capable of being induced to luminesce." Thus, the luminescent label is not even attached directly to the nanotube, but rather is linked to a "component" which is

attached to the nanotube. The limited role of nanotubes as solid supports is disclosed at col. 18, lines 36-37, which states that, "The nanotubes may be used as a solid support for analytical applications...." (emphasis added) Also, col. 41, lines 57-58 recites, "Carbon fibrils were used as a solid support for an enzyme biosensor." (emphasis added)

The absence of detection of any emission spectra from the nanotube itself is further emphasized at col. 40, lines 15-27, which discloses that, "Carbon nanotubes (fibrils) were chemically modified with substrates of hydrolytic enzymes. On the end of the substrate farthest from the fibril was attached a derivative of $Ru(bpy)^{2+}$." "If an enzyme is present that cleaves the scissile bond, the $Ru(bpy)^{2+}$ end of the substrate is released into solution by the action of the enzyme. Following mixture and incubation of the fibrils with the enzyme, the fibrils are removed from the solution (by filtration or centrifugation). The ECL of the remaining solution is measured." (emphasis added)

Thus, the carbon nanotubes of Massey et al. were not even present in the assay mix when the luminescent signal is detected. They were removed from the solution prior to ECL detection. Clearly, Massey et al. did not disclose any detection of an emission spectrum from the nanotubes, which were merely used by Massey et al. as a solid support.

Applicant submits that the element of "detecting the emission spectra of the excited nanotubes" is nowhere described, either expressly or inherently in Massey et al. Withdrawal of the rejection is requested.

Rejection of Claims Under 35 U.S.C. §103

Claims 14-20 and 31-48 stand rejected under 35 U.S.C. §103(a) over the references of Massey et al. and Wohlstadter et al. (U.S. 6,140,045). Applicant respectfully traverses the rejection. A prima facie case of obviousness requires that: [1] the cited references, alone or in combination, must disclose each and every claim limitation; [2] there must be some suggestion or motivation, either in the cited references or in the general knowledge in the art, to modify or combine the reference teachings; [3] there must be a reasonable expectation of success in achieving the claimed invention. [MPEP 2142; *In re Vaeck*, 947 F.2d 488, (Fed. Cir. 1991).] Applicant respectfully submits that the Action failed to establish a prima facie case of

obviousness. Specifically, the cited references, alone or in combination, fail to disclose the element of "detecting the emission spectra of the excited nanotubes." Further, the skilled artisan reading the cited references would have had no reasonable expectation of achieving the claimed invention.

The deficiencies of Massey et al. in failing to disclose the element of "detecting the emission spectra of the excited nanotubes" have been discussed above. Not only does Massey et al. fail to teach or even suggest that element, but Massey et al. actually teaches away from the instant invention by leading the skilled artisan to conclude that an emitted optical signal should be detected from a label compound attached to a nanotube, rather than from the nanotube itself. The skilled artisan reading Massey et al. would have no reason to believe that an emission spectrum could be detected directly from an excited nanotube, and no reasonable expectation of success in achieving the claimed invention.

The reference of Wohlstadter et al. does nothing to cure the deficiencies of Massey et al. In fact, Wohlstadter et al. reinforce the teaching away from the claimed invention, by leading the skilled artisan to conclude that nanotubes should be used as structural supports, or at most as electrodes, not as the direct source of an emission spectrum.

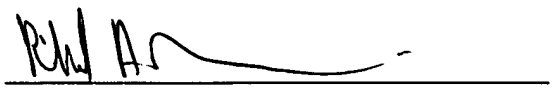
Claims 23-25 of Wohlstadter et al. recite methods, "wherein said support comprise carbon nanotubes or fibrils", "wherein said electrode comprises carbon nanotubes or fibrils" or "wherein said plurality of electrodes comprise carbon nanotubes or fibrils." The use of carbon nanotubes as structural supports or as electrodes is reiterated at col. 4, lines 26-27 which states, "The invention also provides electrodes prepared from graphitic nanotubes." Nowhere does Wohlstadter et al. disclose the use of nanotubes as the source of an emission spectrum. Rather, Wohlstadter et al. utilize nanotubes as structural supports, or at most as electrical elements in an electrode. As with Massey et al., the emission spectra detected by the methods of Wohlstadter et al. are generated by ECL labels. Wohlstadter et al. disclose at col. 1, line 65 through col. 2, line 5, that, "Commonly used ECL labels include: organometallic compounds where the metal is from, for example, the noble metals of group VIII, including Ru-containing and Os-containing organometallic compounds such as the Ru(2,2'-bipyridine).sup.3+ moiety (also referred to as "Rubpy"), disclosed, e.g., by Bard et al. (U.S. Pat. No. 5,238,808). The light generated by ECL

labels can be used as a reporter signal in diagnostic procedures (Bard et al., U.S. Pat. No. 5,221,605)." This is reiterated at col. 43, line 65 through col. 44, line 5, which states that, "ECL labels for use according to the present invention can be selected from among ECL labels known in the art (see Section 2.2, above, and U.S. Pat. No. 5,310,687). The ECL label may comprise, for example, a metal-containing organic compound wherein the metal is selected from the group consisting of ruthenium, osmium, rhenium, iridium, rhodium, platinum, palladium, molybdenum, technetium and tungsten."

Thus, like Massey et al., Wohlstadter et al. would lead the skilled artisan to conclude that analytes can be detected by an optical signal emitted by a ruthenium compound or other ECL label, not from a carbon nanotube. As neither Massey et al. nor Wohlstadter et al. disclose the element of "detecting the emission spectra of the excited nanotubes," Applicant submits that rejection under 35 U.S.C. §103 is improper. Applicant further submits that both cited reference teach away from the claimed invention by leading the skilled artisan to look for an emission spectrum from a label attached to a nanotube, not from the nanotube itself. Applicant also submits that as neither Massey et al. nor Wohlstadter et al. provide any disclosure of detecting an emission spectrum of an excited nanotube, the skilled artisan reading those references would have had no reasonable expectation of success in achieving the claimed invention.

For the reasons stated above, Applicants submit that rejection of the claims as obvious over the references of Massey et al. and Wholstadter et al. lacks a prima facie case and is improper. Reconsideration and withdrawal of the rejection is requested.

Respectfully submitted,



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